Note: "PDF" page refers to the absolute page number of the electronic PDF copy of the guidelines available from the MFRC website, which is followed by the hard copy section and associated page numbers (e.g., TH-10 refers to page 10 of the Timber Harvesting section of the guidebook; GG=general guideline section, BHG=biomass harvesting guideline section). **All strikethrough text will be deleted and underlined text is new.**

Changes to infrastructure guideline

1) Create 3-tier allowable infrastructure guidelines

(PDF page 316, TH-10.)

~~No more than 1-3% of the~~ Timber harvest area occupied by roads and landings ~~(Small or irregularly shaped units may result in higher percentages.)~~ should not exceed recommended amounts shown in Table ??.

(PDF page 328, TH-22).

Size landings to the minimum required for the acres to be harvested, the equipment likely to be used, and the products to be cut. When feasible and prudent, utilize strategies to limit the amount of landing area such as the use of roadside decking and loading, and backing load trucks into a landing.

Plan roads and landings to occupy no more area than recommended in Table ??. ~~than 1-3% of the timber harvest area.~~ See Figure TH-8 as an example.

Table ?? Maximum recommended area of landings and roads*

Harvest area	Infrastructure area
< 20 acres	1 acre
20-30 acres	5% of harvest area
>30 acres	3% of harvest area

* not including skid trails

Changes to leave tree guidelines

1) Allow scattered and clumped leave trees to be used in conjunction
2) Emphasize a distribution which achieves a desired future condition
3) Allow RMZ area to count towards recommended leave tree area
4) Allow consideration of economic value when choosing which trees to leave

(PDF page 249-251, GG-75-78)

✔ Retain leave trees according to the following characteristics related to species, size, condition, and economic value. Specific recommendations for numbers and distribution of leave trees (such as retaining on clearcuts a minimum of 5% of the harvest area in clumps and/or 6-12 scattered leave trees per acre) can be found in *Timber Harvesting: Leave Trees and Timber Stand Improvement: Operational Activities.*

Note: Retaining leave trees to benefit one resource may simultaneously fulfill guidelines focused on another resource. For example, leave trees retained to benefit cavity-nesting wildlife may also provide benefits for visual quality, mast, water quality, cultural resources or wetland habitat.

❒ Species: A mix of species is desirable, but preference should be given to particular species for their longevity, windfirmness or cavity potential. TSI (timber stand improvement) operations often favor retention of one or more preferred tree species, but retention of a mix of naturally occurring species is desired. Recognize that all tree species have some value to particular wildlife, and that it is necessary to work with what is available on a particular site. Table GG-7 characterizes leave trees as excellent, good or fair in terms of longevity, windfirmness and cavity potential. Windfirmness may vary based on site characteristics.

Table GG-7 characterizes leave trees as excellent, good or fair in terms of longevity, windfirmness and cavity potential. Windfirmness may vary based on site characteristics.
*****Table GG-7 will be modified to move aspen from the good to the excellent category******

❒ Size: Larger-diameter leave trees are generally more valuable to wildlife, but smaller trees have the potential to grow over time and provide habitat as a harvested stand regenerates. Therefore, leave a range of sizes on each managed site as follows:
• Leave trees should be at least 6 inches DBH (diameter at breast height).
• About 50% of leave trees should be greater than 12 inches DBH.
• At least 1-2 trees per clump or per acre should be greater than 18 inches DBH (or the largest size class available).

❒ Condition: While trees with some degree of decay or existing cavities have immediate benefits to wildlife, retaining some sound, windfirm trees will provide future snag and cavity needs as a harvested stand regenerates. Therefore, plan to leave trees with a range of conditions on managed sites:
• Include some trees showing signs of decay or trees with cavities.
• Leave some larger, healthy dominants or codominants.
• Leave some smaller, healthy, non-suppressed trees.

❒Economic value: Consider the economic value of the leave trees when selecting which ones to leave.

(PDF page 339-345, TH-34-36)

~~Both options accomplish the management goals of retaining leave trees.~~ Plans for retaining leave trees may utilize one ~~of these options or, when appropriate, they may use the two~~ or both of these options in combination. Clumps are the preferred option because they can increase benefits to multiple resources (see below) and increase efficiency of harvest operations. Plans for leave tree retention should be designed to achieve specific wildlife and silvicultural objectives, and tailored to site-specific conditions. See *Appendix E* for a table that illustrates trees per acre by diameter class and various basal areas.

✔ OPTION 1: Retain leave trees in clumps occupying a minimum of 5% of each clearcut harvest unit.~~,~~ ~~using the following considerations and guidelines to aid in planning and design:~~
~~•With the exclusion of even-age management within riparian management zones (RMZs),.~~ Trees left to protect cultural resources, visual quality, non-open water wetlands, seasonal ponds, mast or other resources, and forested RMZ areas may be counted toward the 5% minimum recommendation. This consideration reflects the concept of overlapping guidelines where, in some instances, applying a guideline to benefit one resource may simultaneously fulfill guidelines focused on another resource.

~~• For sites with an RMZ that are being managed with an even-age management objective, positioning leave tree clumps adjacent to the RMZ is recommended unless there are other site conditions or management objectives that warrant placement elsewhere in the site~~
(Existing language TH-35) Clumps should:
—Be distributed ~~throughout a harvest unit~~ in a configuration that achieves wildlife and silvicultural objectives and maintains efficient harvesting operations
~~—Be adjacent to the RMZ for even-age management~~
—Vary in size, with a minimum of 1/4 acre per clump
—Center around or coincide with such features as:
* Non-open water wetlands and seasonal ponds (see *General Guidelines: Protecting Non-Open Water Wetlands and Seasonal Ponds*)
* One or more large (> 18 inches DBH) active den trees or cavity trees
* Mast trees
* Preferred tree species (such as large white pine)
* Raptor nests or rookeries
* Sensitive communities or sites

OPTION 2: As an alternative or supplement to clumps, employ scattered individual leave trees, especially if they are larger, windfirm specimens of preferred species. Scattered leave trees may be easier to apply to small or narrow harvest units than clumps. Use the following guidelines for scattering individual leave trees:
• On most clearcut sites where this method is employed, leave 6-12 trees standing per acre, selecting trees preferentially. For preferred characteristics, see *General Guidelines: Retaining Leave Trees.*
• On certain clearcut sites, there may be no leave trees or as many as 15 or more leave trees per acre, depending on local conditions or landowner objectives, but the majority (80%) of these sites and their overall harvest acres should retain an average of 6-12 per acre. See Table TH-1.
• On non-clearcut sites (including selection or partial-cut), be sure that the remaining stand includes a minimum of 6 cavity trees, potential cavity trees and/or snags per acre.

• Distribute scattered leave trees ~~throughout the harvested site as much as possible~~. in a configuration that achieves wildlife and silvicultural objectives and maintains efficient harvesting operations

Changes to biomass guidelines

1) Modify existing guideline to adjust FWD retention if incidental breakage differs from the assumed amount
2) Allow deviation from recommended FWD retention to achieve Silvicultural objectives
3) Reconcile slash retention language to conform with biomass guidelines.

(PDF page 543, BHG-28)

Retain and scatter tops and limbs from 20% of trees harvested in the general harvest area (one "average-sized" tree out of every five trees harvested). It is appropriate to adjust the amount of retention if incidental breakage during felling is more or less than 10-15% (see page 29).

(PDF page 544, BHG-29)

The overall goal of FWD retention is to retain about one-third of the ~~FWD~~ tops and limbs from trees that are harvested on a site. This goal is achieved by intentionally retaining 20% of ~~the FWD (~~tops and limbs ~~from one "average sized" tree out of every five trees harvested),~~ with an assumed additional 10-15% achieved by incidental breakage during felling and skidding. ~~(Usually, more breakage occurs in winter than in summer.)~~ Incidental breakage will vary depending on equipment type, season of harvest, cover type, and stand condition. Adjust the amount of intentional retention if incidental breakage is more or less than 10-15%.

(New guideline – location to be determined)

It is acceptable to adjust the amount of slash retention if necessary to meet silvicultural objectives (see examples on page 32-33)

(PDF page 197, GG-23)

Modify management activities to maintain, promote or enhance ETS species (endangered, threatened or of special concern) on the site, including retention of all slash during harvesting operations if slash-dependent ETS species are present.

(PDF page 321, TH-15)

For aspen or hardwood cover types on well-drained sandy soils or on shallow soils (8 inches or less) over bedrock, consider one or more of the following guidelines:
• Convert or manage site for tree species that store fewer nutrients in the bole and bark of the tree, such as red pine or jack pine.
• Retain or redistribute slash on the site.
• Avoid full-tree harvesting or full-tree skidding that piles slash, or redistribute slash back onto the site.
• During non-frozen seasons, leave slash in small piles or drags along skid trails or in the skid trails themselves, rather than trafficking off of established trails, because the negative effects of soil trafficking outside of skid trails may outweigh the benefits of redistributing slash.
• Add nutrients to the site, such as municipal sludge, ash or commercial fertilizer. For sources of technical assistance before applying nutrients, see *Resource Directory*.
• Avoid shortened rotations.
• Consider extending harvest rotation age

(PDF page 322, TH-16)

~~For organic soils deeper than 24 inches that are ombrotrophic, consider apply one or more of the following guidelines:~~
~~• Retain or redistribute slash on the site.~~
~~• Avoid full-tree harvesting or full-tree skidding that piles slash, or redistribute slash back onto the site.~~

(PDF page 334, TH-28)

✔Retain and disperse at least one-third of the slash following harvesting at most sites. Retain and disperse all slash in the following situations:
• Native plant communities listed in Appendix J are present*
• If slash-dependent ETS species are present*
• When harvesting in riparian management zones
• Within 25 feet of a dry wash bank
• Erosion prone sites with steep slopes (>35%)
• Sites with shallow soils (8 inches or less) over bedrock
• Sites with ombrotrophic soils greater than 24 inches deep (These sites typically have sparse (25--75%) cover that is predominantly (>90%) black spruce and stunted (<30 feet high).

* consult with local DNR offices to determine if slash retention is necessary at your site

✔ ~~If moving slash on-site is desirable~~ When moving or redistributing slash on the site, use equipment and tactics that minimizes soil disturbance including soil compaction.

Changes to riparian management zone (RMZ) guidelines

1) Modification of RMZ widths
2) Modification of RMZ residual basal area (standardized to 60 ft^2)

(PDF page 203, GG-29)

Width~~s, residual basal area and other~~ recommendations ~~are provided based on different types of water bodies, site conditions within the riparian area, and management objectives (even-age or uneven-age management).~~ are based on the water body type, its size, and whether or not it is trout bearing. Residual basal area recommendation are the same for all water bodies and assume that riparian areas are primarily being managed for longer-lived covertypes.

All other content will be retained on PDF pages 203-210, GG-29-36

(PDF page 211, GG-37)

Width ~~and basal area~~ recommendations are based on the type and size of the water body ~~on the following:~~ as outlined in Table ??. Recommended minimum residual basal area for all RMZ's is 60 ft^2. Width and residual basal area recommendations apply to the average condition of the RMZ, and should not be viewed as strict minimums for every portion of the RMZ.

~~❒ Type of water body~~
~~❒ Riparian area site condition~~
~~❒ Management objective (even-age or uneven-agemanagement~~)
~~The recommendations are divided into two primary groups:~~
~~❒ Designated trout streams (and their designated tributaries) and designated trout lakes~~
~~❒ Non-trout streams, non-trout lakes, and open waterwetlands~~
~~Recommended guidelines for the second group (e.g., non-trout streams, non-trout lakes) vary depending upon the forest typeadjacent to the water body.~~

Table ??. Recommended RMZ widths for various water body categories

Water body characteristics	RMZ widths (ft)
Designated trout streams, tributaries, and lakes	165
All non-trout streams ≥ 3 ft. wide, and lakes and open water wetlands ≥ 1 ac. in size	120
All non-trout streams < 3 ft. wide and lakes and open water wetlands < 1 ac. in size[1]	50

[1] these recommendations do not apply to seasonal ponds. Please see section ?? for more information on recommended practices related to seasonal ponds

*****All content will be deleted on PDF pages 214-241, GG-40-67*****

Changes to recommended documentation (PDF page 189, GG-15)

✔ Document the width and residual basal area of the RMZ, and the management objective for the RMZ ~~. That management objective~~ (e.g., early successional wildlife habitat, retention or regeneration of long-lived conifer species) ~~may be the same or different from the objective for the general harvest area.~~. ~~Indicate the preferred residual tree species, as well as the distribution of those residual trees within the RMZ (e.g., clumped, scattered).~~

✔ Document <u>the configuration of</u> leave tree clumps or scattered individual leave trees within the general harvest area ~~and adjacent to the RMZ for even-age management. the~~ <u>that will achieve wildlife objectives associated with leave tree retention, while maintaining operability of the management activity.</u>

✔ <u>Document any Silvicultural justification for deviating from slash retention guidelines during harvesting operations (e.g., lower retention to facilitate post-harvest planting, higher retention to inhibit browse damage to regeneration, etc.).</u>

Changes to petroleum spill guidelines

(PDF pg. 244; GG - 70)

✔ <u>State law requires immediate action as reasonably possible to clean up all petroleum spills, regardless the amount, to minimize or abate pollution of waters of the state.</u>

✔ Report all petroleum spills of five or more gallons<u>, including the location of the spill, the type of material and volume of the spill, and a description of what you plan to do for cleanup</u>. Direct all reports to the Minnesota Duty Officer. The two 24-hour phone numbers are (651) 649-5451 (Metro Area) and (800) 422-0798 (Greater Minnesota). The Minnesota Duty Officer will contact appropriate state agencies.

~~✔ Thin-spread any soil contaminated by spills of petroleum products of less than 5 gallons.~~

✔ <u>Petroleum contaminated soil of ten cubic yards or less may be thin-spread on a suitable site without the requirement to do follow-up sampling as long as the following conditions are met:</u>
<u>- Permission from the landowner has been received to thin-spread</u>
<u>- The area of spread is isolated and at least 200 feet from surface water, wells, and sewers</u>

- Thin-spreading will occur between April 1 and November 1
- Contaminated soil is spread at a maximum thickness of 2 inches and incorporated into the native soil

✔ If you estimate that you will be digging up ten or more cubic yards of soil, ask the duty officer to connect you with the on-call MPCA emergency responder for immediate advice and approval of your cleanup plan.

Informational items and clarifications (these items were not peer reviewed)

Clarification on when erosion control is needed

(PDF page 255, GG-81)

Stabilize bare soil areas and install water diversion devices and erosion control barriers where appropriate to prevent or minimize erosion and sedimentation from roads, skid trails and landings into surface water and cultural resource areas. Erosion control is usually necessary on all landing, road and skid trail segments where sedimentation to lakes, streams, and wetlands is possible including when the slope is greater than 2% and vegetative cover is insufficient to control erosion. Erosion control is recommended for all approaches to wetland and stream crossings, and may be necessary in other situations depending on site-specific factors.

(PDF page 268, Roads-12).

Establish and maintain appropriate stabilization, drainage and erosion control measures to prevent sedimentation of lakes, streams, and wetlands. Check structures frequently enough to ensure that they are functioning as designed, especially in situations where sedimentation risk is high. ~~could impact water quality~~.

Planning and watershed condition (new info to be added at GG-9)

❒When developing a management plan for your site, consider the overall condition of your watershed, the likelihood of your plans to cause detriment to water quality and habitat in the watershed, and your ability to address any impacts including consideration of the total area of the watershed that you manage. If management activities are likely to impact watershed habitat or water quality, modify your plan such that impacts are minimized. The following resources will assist you in evaluating your watersheds condition.

Resources

DNR watershed assessment tool

http://www.dnr.state.mn.us/watershed_tool/index.html

PCA watershed approach

http://www.pca.state.mn.us/index.php/water/water-types-and-programs/surface-water/basins-and-watersheds/watershed-approach.html

EPA Watersheds

http://water.epa.gov/type/watersheds/index.cfm

Planning and invasive species (new info to be added in beginning of GG section)

The spread of invasive species is one of the greatest threats to sustainable forestry and the maintenance of native ecosystems and the many benefits they provide. Invasive species are those species not native to Minnesota whose establishment causes or is likely to cause economic, environmental or human harm. Once established, invasive plant species are generally able to outcompete many of our common native species, inhibiting regeneration and growth of our native forests and reducing biodiversity. The ecological and economic impact of invasive species is tremendous, underlying an urgent need to utilize practices that inhibit their establishment and spread.

There are several laws in Minnesota which govern the transport, control, and eradication of invasive species (see resources listed below). Of particular applicability to forestry is the Noxious Weed Law, which *requires* the control and eradication of certain plant species including many that are considered invasive such as buckthorn, garlic mustard, and non-native thistles.

Timber harvesting can increase the spread of invasive species by creating conditions conducive to their transport and establishment. One of the most efficient approaches to slow the spread of invasive species during timber harvesting is to evaluate and develop a plan to address any threat prior to commencing operations. Working together, landowners, managers, and loggers will be critical to slowing the spread of invasive species during timber harvesting operations.

Prior to designing the timber harvest or putting the sale out for bid, landowners or managers should utilize the following planning considerations as appropriate to control the spread of invasive species during timber harvesting operations.

- Become familiar with invasive species common to your area of operation including their identification and life cycle.
- Review the existing invasive species laws and regulations to determine any regulatory requirements that might be associated with your timber harvesting operation.
- Contact the local weed inspector to determine if invasive species are known to occur in or around the planned harvest area.

- Inspect the site for the presence of invasive species, identify those present on the site, the severity of infestation, and delineate areas of infestation in the harvest plan.

Invasive species resources

- MDA – noxious weed law, regulations, educational info
  http://www.mda.state.mn.us/plants/pestmanagement/weedcontrol.aspx
  http://www.mda.state.mn.us/plants/pestmanagement/invasivesunit.aspx
- DNR terrestrial invasive plant web page
  http://www.dnr.state.mn.us/invasives/terrestrialplants/index.html
- SFI "Minnesota's Forest Invaders: Guide to Invasive Species"
  http://www.minnesotaforests.com/resources/pdfs/invasivespecies.pdf
- National Invasive Species Information Center
  http://www.invasivespeciesinfo.gov/unitedstates/mn.shtml

Clarification on exceptions to retention of conifer regeneration for insect and disease concerns (PDF page 345, TH-39)

Protect conifer regeneration (less than 4 inches DBH) when harvesting mixed deciduous coniferous stands. In some instances it may be appropriate not to retain conifer regeneration for insect and disease considerations or when natural disturbance regimes are altered (e.g., absence of fire in fire-dependent systems). See *Leave Trees* (page 33) and *General Guidelines: Retaining Leave Trees* for guidelines on retention of mature conifer trees. Clumps of conifers are preferable to scattered trees.